

NASA's Space Launch System: A Heavy-Lift Platform for Entirely New Missions

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Abstract

The National Aeronautics and Space Administration's (NASA's) Space Launch System (SLS) will contribute a new capability for human space flight and scientific missions beyond low-Earth orbit. The SLS Program, managed at NASA's Marshall Space Flight Center, will develop the heavy-lift vehicle that will launch the Orion Multi-Purpose Crew Vehicle (MPCV), equipment, supplies, and major science missions. Orion will carry crews to space, provide emergency abort capability, sustain the crew during space travel, and provide safe reentry from deep-space return velocities. Supporting Orion's first autonomous flight to lunar orbit and back in 2017 and its first crewed flight in 2021, the SLS ultimately offers a flexible platform for both human and scientific exploration. The SLS plan leverages legacy infrastructure and hardware in NASA's inventory, as well as continues with advanced propulsion technologies now in development, to deliver an initial 70 metric ton (t) lift capability in 2017, evolving to a 130-t capability after 2021, using a block upgrade approach. This paper will give an overview of the SLS design and management approach against a backdrop of the missions it will support. It will detail the plan to deliver the initial SLS capability to the launch pad in the near term, as well as summarize the innovative approaches the SLS team is applying to deliver a safe, affordable, and sustainable long-range capability for entirely new missions—opening a new realm of knowledge and a world of possibilities for multiple partners. Design reference missions that the SLS is being planned to support include asteroids, Lagrange Points, and Mars, among others. The Agency is developing its mission manifest in parallel with the development of a heavy-lift flagship that will dramatically increase total lift and volume capacity beyond current launch vehicle options, reduce trip times, and provide a robust platform for conducting new missions destined to rewrite textbooks with the information they deliver, while creating a framework for further collaboration among domestic and international partners, and potentially spurring economic expansion into new markets.